Fault Study for the EBIS-LTB Region

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March 5, 2007

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Date: _____

Fault Study No. _____

1 Study Plan

1.1 Goal

The goal of this study is to produce a proton beam loss in the LTB line close to the place where the LTB line crosses the EBIS-to-Booster line and measure the resulting prompt radiation on the Linac side of the EBIS-Booster penetration. (The place where the LTB line crosses the EBIS-to-Booster line is downstream of LTB dipole DH76 and upstream of quadrupole Q8.) The study is to be conducted in accordance with AGS OPM 9.1.9.

1.2 Initial (non-fault) Beam Conditions

1. The study is to be conducted with protons from Linac.
2. The maximum proton kinetic energy in the LTB line is 200 MeV. The repetition period is at least 4 seconds.
3. The maximum intensity in the LTB line is 5×10^{11} protons per repetition period.
4. The Booster magnetic cycle is a 300 ms long polarized proton type cycle that can accelerate protons to a kinetic energy of 1.5 GeV.

1.3 Method

1. The loss will be produced by inserting LTB vacuum valve ltb-sv-076. This is located 10 inches downstream of the point where the LTB beam centerline crosses the EBIS-to-Booster beam centerline.

2. Before opening the LTB beamstops, record LTB and Booster loss monitor outputs. Record radiation levels from Chipmunks NM112 and NM113. Record radiation levels at the positions of these Chipmunks with the HP1010 meter.

3. With RCD personnel monitoring levels on the Linac side of the EBIS-Booster penetration, open the LTB beam stops and establish low intensity proton beam in Booster on the polarized proton cycle. Record magnetic cycle and repetition period.

4. The Booster RF should be programmed to shut off at a point in the cycle where the beam has gained enough energy to allow for a good measurement of the circulating beam current. As the field increases beyond this point, beam will be lost on the radially inward side of the vacuum chamber. The B6 dump bump should be adjusted so that this beam is lost on the B6 dump.

5. Before establishing the fault condition, adjust the Linac pulse width to establish the desired intensity for the study. Record LTB and Booster beam current transformer traces. (The beam current transformers in the LTB line are XFMR011 and XFMR100.)

6. Insert LTB vacuum valve ltb-sv-076. Record levels from Chipmunks NM112 and NM113. Record levels at the positions of these Chipmunks with the HP1010 meter.

1.4 Survey Locations

Figure 1 shows the region on the ground floor of the Linac building near the EBIS-Booster penetration pipe opening. Here the magenta rectangles labeled A and B show the location of chipmunks NM112 and NM113 respectively. Chipmunk NM112 is set to alarm at 2.0 and interlock at 2.5 mrem/hour. Chipmunk NM113 is connected to scalers for radiation measurements (it is not an interlocking chipmunk). The dashed magenta line marks the extent of a buffer zone around the penetration pipe

opening. The buffer zone is to be roped off and posted as a "Radiation Area" with the requirement that anyone entering the area be accompanied by a Radiation Control Technician monitoring the radiation levels.

The survey locations are:

1. On the ground floor of the Linac building near chipmunks NM112 and NM113.
2. On the second floor of the Linac building just above the place where the EBIS-Booster penetration pipe comes through the wall.

All surveys are to be conducted with the HP1010 meter.

1.5 Radiation Estimate

Dana Beavis and Kin Yip [1] have estimated the dose rate at the end of the EBIS-Booster penetration pipe in the Linac building for protons with 200 MeV kinetic energy lost at the place where the LTB line crosses the EBIS-to-Booster line. An MCNPX calculation done by Yip gives a dose of 4.4×10^{-16} rem per proton lost. Assuming a loss of 5×10^{11} protons every 4 seconds then gives a dose rate of 198 millirem per hour.

References

[1] D. Beavis, "EBIS Penetration into the Booster", Memo to RSC, A. Pendzick, and J. Alessi, 29 March 2006.

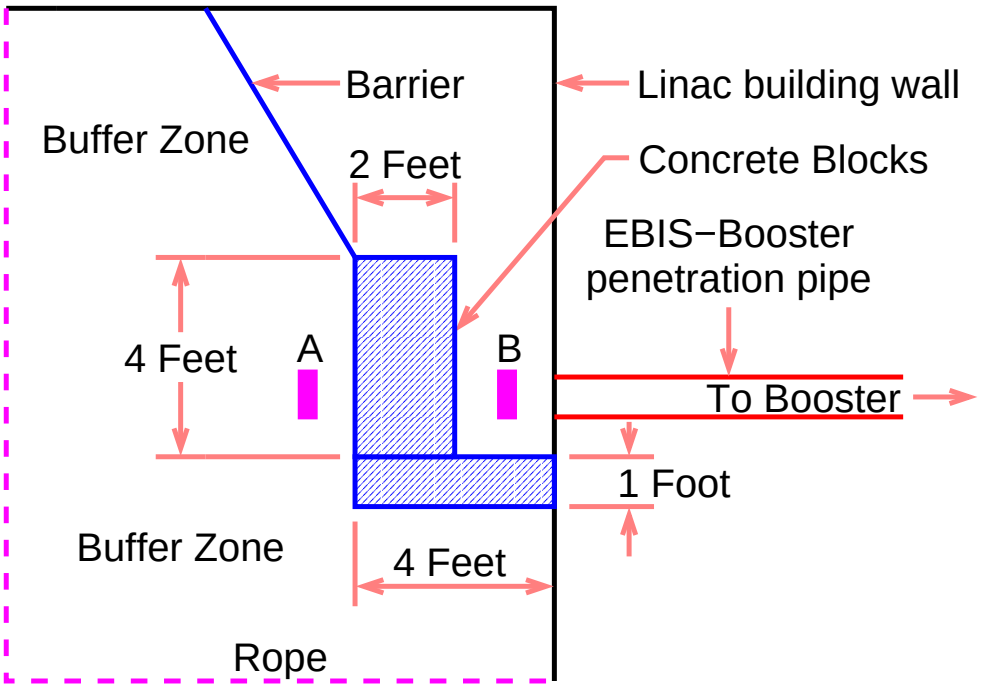

Figure 1: Region on the ground floor of the Linac building near the EBIS-Booster penetration pipe opening. The magenta rectangles labeled A and B show the positions of chipmunks NM112 and NM113 respectively. Chipmunk NM112 is set to alarm at 2.0 and interlock at 2.5 mrem/hour. Chipmunk NM113 is connected to scalers for radiation measurements (it is not an interlocking chipmunk). The dashed magenta line marks the extent of a buffer zone around the penetration pipe opening. The buffer zone is to be roped off and posted as a "Radiation Area" with the requirement that anyone entering the area be accompanied by a Radiation Control Technician monitoring the radiation levels.